

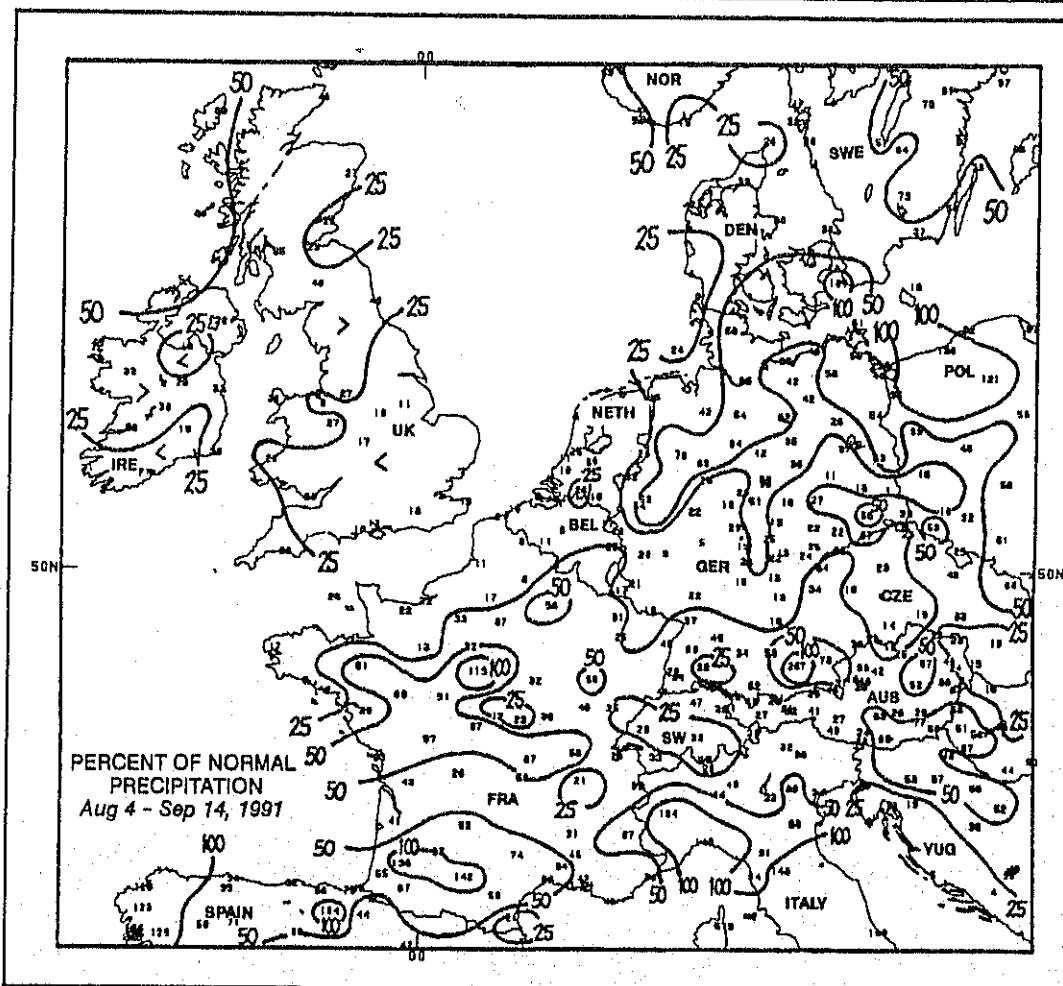
CONTAINS:
SUMMER 1991
UNITED
STATES
CLIMATE
SUMMARY

WEEKLY CLIMATE BULLETIN

No. 91/37

Washington, DC

September 14, 1991



Abnormally dry weather has gripped much of western Europe, where less than half of normal rainfall has been measured since early August. Shortfalls of 50 - 120 mm are common over much of the region while deficits up to 200 mm have accumulated across Great Britain, the Benelux countries, Germany, and Austria. The Rhine River is at dangerously low levels, forcing

river barges to reduce their loads to about one third of normal, according to press reports. The river has dropped to below half of normal width at some locations as streamflows approach record low levels.



UNITED STATES DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE-NATIONAL METEOROLOGICAL CENTER

CLIMATE ANALYSIS CENTER



WEEKLY CLIMATE BULLETIN

This Bulletin is issued weekly by the Climate Analysis Center and is designed to indicate, in a brief concise format, current surface climatic conditions in the United States and around the world. The Bulletin contains:

- *Highlights of major climatic events and anomalies.*
- *U.S. climatic conditions for the previous week.*
- *U.S. apparent temperatures (summer) or wind chill (winter).*
- *Global two-week temperature anomalies.*
- *Global four-week precipitation anomalies.*
- *Global monthly temperature and precipitation anomalies.*
- *Global three-month precipitation anomalies (once a month).*
- *Global twelve-month precipitation anomalies (every three months).*
- *Global three-month temperature anomalies for winter and summer seasons.*
- *Special climate summaries, explanations, etc. (as appropriate).*

Most analyses contained in this Bulletin are based on preliminary, unchecked data received at the Climate Analysis Center via the Global Telecommunications System. Similar analyses based on final, checked data are likely to differ to some extent from those presented here.

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GLOBAL CLIMATE HIGHLIGHTS

MAJOR CLIMATIC EVENTS AND ANOMALIES AS OF SEPTEMBER 14, 1991

1. Alaska:

HEAVIER PRECIPITATION OBSERVED.

Near normal precipitation was measured across the northern tier of the state while abnormally dry conditions continued across east-central and west-central sections, where only 10%-50% of normal precipitation has been recorded since mid-August [8 weeks].

2. Central and Eastern United States:

HOT WEATHER CONTINUES AS DRYNESS BECOMES SPOTTY.

Scattered showery rainfall again brought a decrease in short-term moisture deficits to much of the region. Exceptionally high long-term shortfalls continue, however, through the interior mid-Atlantic, central Appalachians, lower and eastern Ohio Valley, and portions of the Corn Belt [Ended after 16 weeks]. Oppressive heat, however, continued to bake much of eastern North America. Weekly departures exceeded +3°C from the Appalachians westward to the High Plains and from south-central Canada southward to the Gulf Coast region. Parts of the central Great Plains and western Corn Belt recorded temperatures +6°C to +8°C above normal while average daily maximum apparent temperatures during September 1 - 14 exceeded 37°C in northern Mississippi [4 weeks].

3. South-Central United States:

RAINFALL TOTALS DECREASE.

Moderate to heavy rains (50-95 mm) fell from southwestern Oklahoma southward through southwestern Texas while lower amounts (25-50 mm) were recorded across central Oklahoma. Less than 25 mm were measured elsewhere as moisture surpluses decreased at most spots. Despite the recent drop in precipitation, parts of Texas, northern Louisiana, and Oklahoma have received 2-3 times normal rainfall since early August, with surpluses up to 200 mm accumulating during the period [Ending after 11 weeks].

4. The Azores:

TROPICAL STORM ERIKA BLASTS THE ISLANDS.

Daily rainfall totals up to 64 mm and winds gusting to 75 kph accompanied Erika as the storm swept through The Azores. Erika's rains combined with early September rainfall to bring abnormally wet conditions to much of the region. Ponta Domingo has received 187 mm of rain since May 1, with 123 mm of that total falling on September 4, 5, and 12. Several spots have measured 80-110 mm above normal rainfall since September 1 [2 weeks].

5. Central and Northwestern Europe:

PRECIPITATION SHORTFALLS INCREASE AS SLIGHTLY COOLER CONDITIONS PREVAIL.

Scattered moderate precipitation (20-50 mm) fell across central Europe, the southern two-thirds of France, and central and northern Great Britain while little or none was recorded elsewhere. Since early August, shortfalls of 50-120 mm have become widespread throughout the region, with 120-200 mm deficits measured across Great Britain, the Benelux countries, Germany, and Austria. In addition, nearly 250 mm less than normal precipitation has fallen on parts of Switzerland [6 weeks]. Weekly temperature departures

declined last week, with most locations observing temperatures 2°C to 4°C above normal. The Benelux countries and northern and central Germany experienced near to below normal temperatures [Ending after 7 weeks].

6. Western India and eastern Pakistan:

LITTLE RAINFALL MEASURED AS DRY SEASON APPROACHES.

Little or no rain fell across the region; however, moisture deficits continued to decrease in conjunctions with the declining normals of late summer [Ended after 9 weeks].

7. Southeast Asia:

ANOTHER ROUND OF FLOODING AFFLICTS CAMBODIA AND SOUTHEASTERN THAILAND.

Although no rainfall reports are received from Cambodia, the southeastern coast of Thailand received 150-300 mm of rain last week as severe flooding was again endured in southwestern Cambodia and adjacent Thailand. According to press reports, more than 150,000 homes were destroyed, and the Mekong River has again risen to dangerously high levels [6 weeks].

8. Northeastern China and Northern North Korea:

VERY DRY CONDITIONS CONTINUE.

Scattered totals of 10-25 dampened central and southwestern sections of the afflicted region while little precipitation was recorded elsewhere. Since early August, deficits of 75-150 mm have accumulated at most locations, particularly through southeastern Heilungjiang [6 weeks].

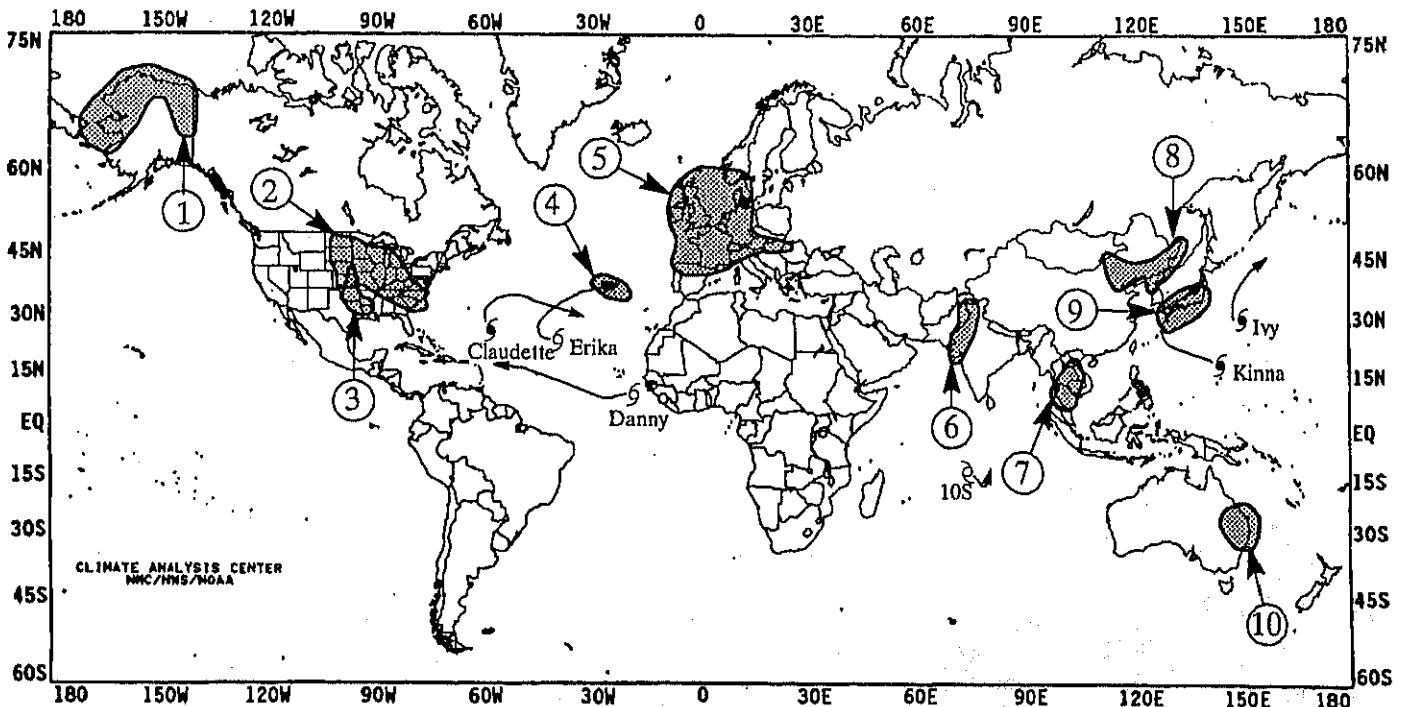
9. Central and Southern Japan:

TYPHOONS IVY AND KINNA BRING HEAVY RAINS AND HIGH WINDS. Early in the week, Typhoon Ivy, packing winds gusting up to 185 kph, tracked from south of Tokyo northward and then northeastward, missing the southeastern Honshu coast by less than 150 km. Heavy rains associated with the storm damaged over 500 dwellings and disrupted transportation in Tokyo, according to press reports. Only a few days later, Typhoon Kinna moved northwestward into the northern East China Sea before veering northeastward and making landfall near Nagasaki, Kyushu with winds gusting to 205 kph. According to press reports, the latter storm brought waves more than 6 meters high into western Kyushu and damaged more than 2700 homes. The heaviest rains fell on southern and southeastern Honshu, where 100-300 mm were measured. Typhoon Kinna dropped 80-150 mm on western Honshu before moving quickly northeastward along the western coast of Japan and rapidly disintegrating. The remainder of the southern half of the country received 40-80 mm [Episodic Event]

10. East-Central Australia:

EXCEPTIONALLY DRY WEATHER PERSISTS.

The southern tier of the afflicted region received spotty 10-30 mm rainfall totals, but little or none was measured elsewhere, allowing precipitation shortfalls to increase. Despite persistently wet conditions farther south through Victoria and Tasmania, Shortfalls up to 135 mm have accumulated since early August. According to press reports, the drought is expected to cause a 33% drop in wheat production this season [7 weeks].



EXPLANATION

TEXT: Approximate duration of anomalies is in brackets. Precipitation amounts and temperature departures are this week's values.

MAP: Approximate locations of major anomalies and episodic events are shown. See other maps in this Bulletin for current two week temperature anomalies, four week precipitation anomalies, long-term anomalies, and other details.

UNITED STATES WEEKLY CLIMATE HIGHLIGHTS

FOR THE WEEK OF SEPTEMBER 8 - 14, 1991

The second week of September was marked by mid-summerlike conditions as hot weather reigned from the central High Plains to the mid-Atlantic Coast. The unusually warm conditions along with high humidities produced apparent temperatures above 100°F in the southern Plains and Deep South northward into the Ohio Valley. Up to three dozen record daily highs were established from the lower Mississippi Valley to southern New England. On Monday, Philadelphia, PA reported a high of 90°F, marking the 51st time this year and setting a new record for the number of 90°F (or greater) days in a season. Farther west, a marked contrast in seasons occurred. Sharply colder weather was felt across the Rockies with lows dipping below freezing as far south as Colorado. The first widespread snowfall of the season blanketed parts of Wyoming with up to 3 inches recorded at Indian Creek, WY. Elsewhere, strong thunderstorms battered portions of the Great Basin, southern Rockies and Plains, and upper Midwest, dumping up to 4 inches of rain. Heavy rain in northern Utah further aggravated flooding from the previous weekend's (7th and 8th) record rainfall which damaged up to 100 homes in North Ogden, UT according to press reports. Meanwhile, three tropical systems (one hurricane and two tropical storms) churned in the Atlantic Ocean. All three remained over the open waters of the Atlantic and far from the U.S. mainland, with only Hurricane Claudette brushing Bermuda. In Alaska, heavy rain inundated the southeastern part of the state while wintry conditions affected the extreme northern areas. Yakutat, AK measured over a foot of rain while Barrow, AK observed snow and wind chills near zero. In Hawaii, mostly mild and dry weather continued. On Sunday, a dust devil (a rare occurrence in Hawaii) damaged two homes on Oahu.

The week began with a cold front in the northern Plains. Behind the front, crisp Canadian air settled southward from Canada into the northern Rockies. Highs at several locations in Montana on Monday were only in the fifties. To the south of the front record heat roasted the central Plains with readings topping 100°F in Kansas. Severe weather erupted along and ahead of the front as it trekked eastward. Brief and torrential rains, strong wind gusts, and hail pounded the upper Mississippi Valley and Midwest. Delano, MN recorded nearly 3 inches of rain in 30 minutes while portions of Illinois were battered by thunderstorm wind gusts up to 60 mph, downing trees and power lines. Strong thunderstorms also doused the southern Rockies and spawned severe weather in the Great Basin. Heavy rains caused flash flooding in Hobbs, NM, submerging some roads in two feet of water. Meanwhile, a thunderstorm in Utah produced a tornado at Brigham City.

During the last half of the week, the front in the northern U.S. continued its eastward progression. Strong thunderstorms once again popped-up along and ahead of the front while behind

the system autumn-like weather funnelled into the Great Lakes and eventually across New England. Lows dipped into the thirties across the northern half of New England Friday morning. Newcomb, NY registered a low of 29°F Friday morning. The trailing edge of the front stalled across the Southeast and westward into the middle Mississippi Valley, providing a brief respite from unusually warm conditions in the mid-Atlantic and Ohio Valley. However, hot weather once again migrated northward into the Midwest and Ohio Valley ahead of a weak storm system in the central U.S. Temperatures soared above 90°F from southern Texas to central Indiana on Thursday and ultimately spread to the mid-Atlantic by Saturday. High humidities combined with the heat, producing oppressive conditions across the South. Elsewhere, a revived monsoonal flow generated thunderstorms, packing heavy rains across the southern Plains and Rockies. Nearly 7 inches of rain inundated south-central Texas and nearly half a foot soaked southeastern New Mexico, causing flash floods.

According to the River Forecast Centers, the greatest weekly totals (more than 2 inches) occurred in the southern High Plains, south-central Texas, western Gulf Coast, south-central Oklahoma, the upper Midwest, southern Alaska, and portions of the Appalachians, the Ohio Valley, the central and northern Plains, and Rockies (Table 1). Light to moderate precipitation was observed across most of New England, the Great Lakes, the Ohio and Tennessee Valleys, the southern two-thirds of Florida, the Plains, the Rockies, eastern Hawaii, and most of Alaska. Little or no precipitation occurred along the Northeast Coast, across the coastal Plains of the Carolinas and Georgia, the central Gulf Coast, the Far West, extreme northern Alaska, and the remainder of the Hawaiian Islands.

Abnormally warm weather enveloped most of the nation east of the Rockies (Table 2). Weekly departures between +9°F and +13°F were common from the south-central Plains into the Ohio Valley. Departures of +4°F to +8°F were prevalent in the northern and central High Plains eastward to the Appalachians. Near to slightly above normal temperatures were limited to the coastal Atlantic, most of Texas, and along the lee-side of the Rockies. In Alaska, mild conditions prevailed across most of the state with weekly departures between +2°F and +4°F.

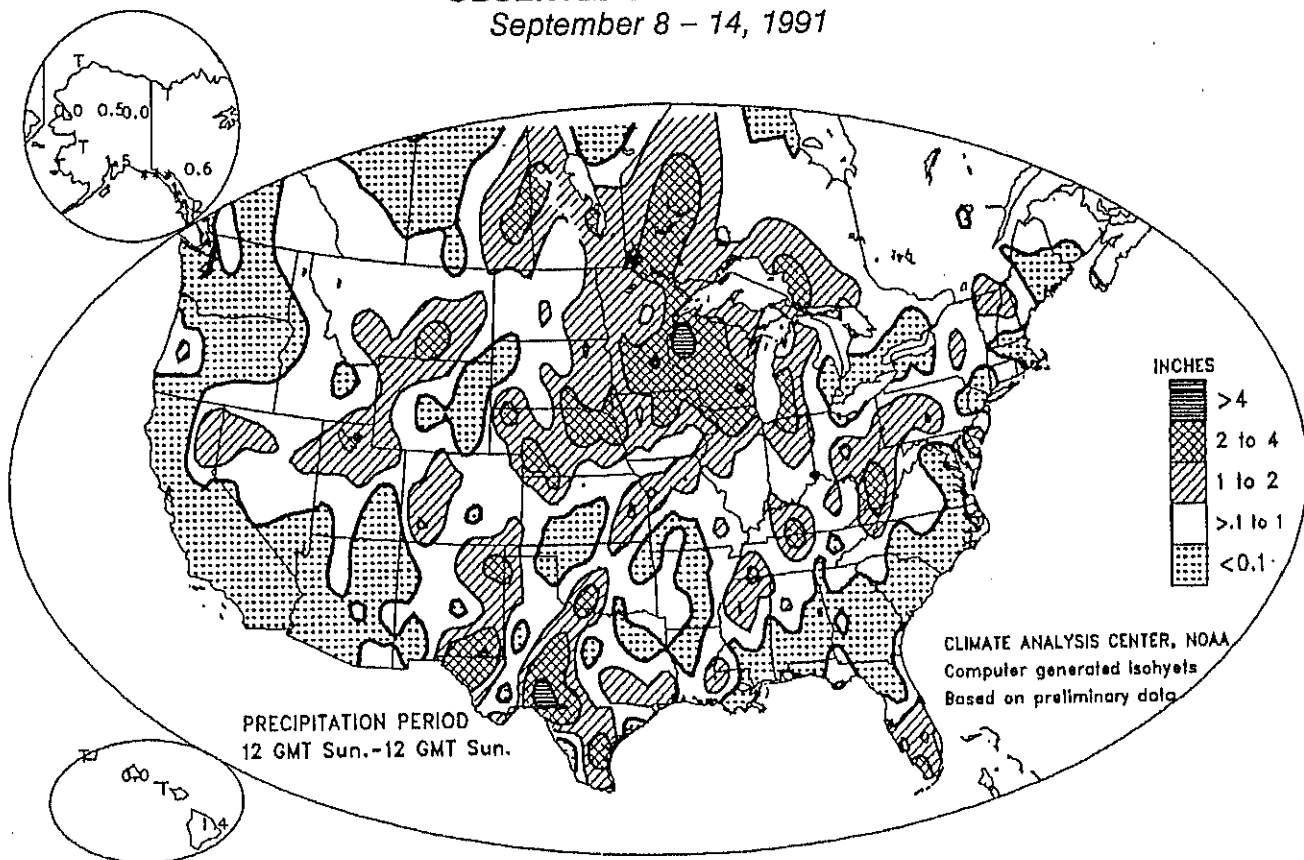
In sharp contrast, unusually cool weather gripped much of the contiguous U.S. west of the Rockies (Table 3). Weekly departures between -3°F and -5°F stretched from extreme southern California to northern Montana. Near to slightly below normal temperatures were observed in the Pacific Northwest and extreme northern New England. In Alaska, cooler than normal conditions were limited to a few locations in the eastern and extreme northern parts of the state with the greatest weekly departure of -5°F at Barrow, AK.

TABLE 1. SELECTED STATIONS WITH 2.50 OR MORE INCHES OF PRECIPITATION DURING THE WEEK OF SEPTEMBER 8 - 14, 1991

	<u>TOTAL</u> (INCHES)	<u>STATION</u>	<u>TOTAL</u> (INCHES)
	12.45	MT WASHINGTON, NH	2.85
K	7.14	MASON CITY, IA	2.84
	6.79	KODIAK, AK	2.83
	4.64	MADISON, WI	2.74
	3.64	FT DODGE, IA	2.71
	3.61	CORPUS CHRISTI, TX	2.70
	3.53	BURLINGTON, IA	2.67
	3.43	DUBUQUE, IA	2.66
	3.27	MILWAUKEE, WI	2.62
	3.19	JAMESTOWN, ND	2.62
	3.01	DEL RIO/LAUGHLIN AFB, TX	2.57
	2.88	COLUMBUS, OH	2.53

OBSERVED PRECIPITATION

September 8 - 14, 1991



DEPARTURE OF AVERAGE TEMPERATURE FROM NORMAL (°F)

September 8 - 14, 1991

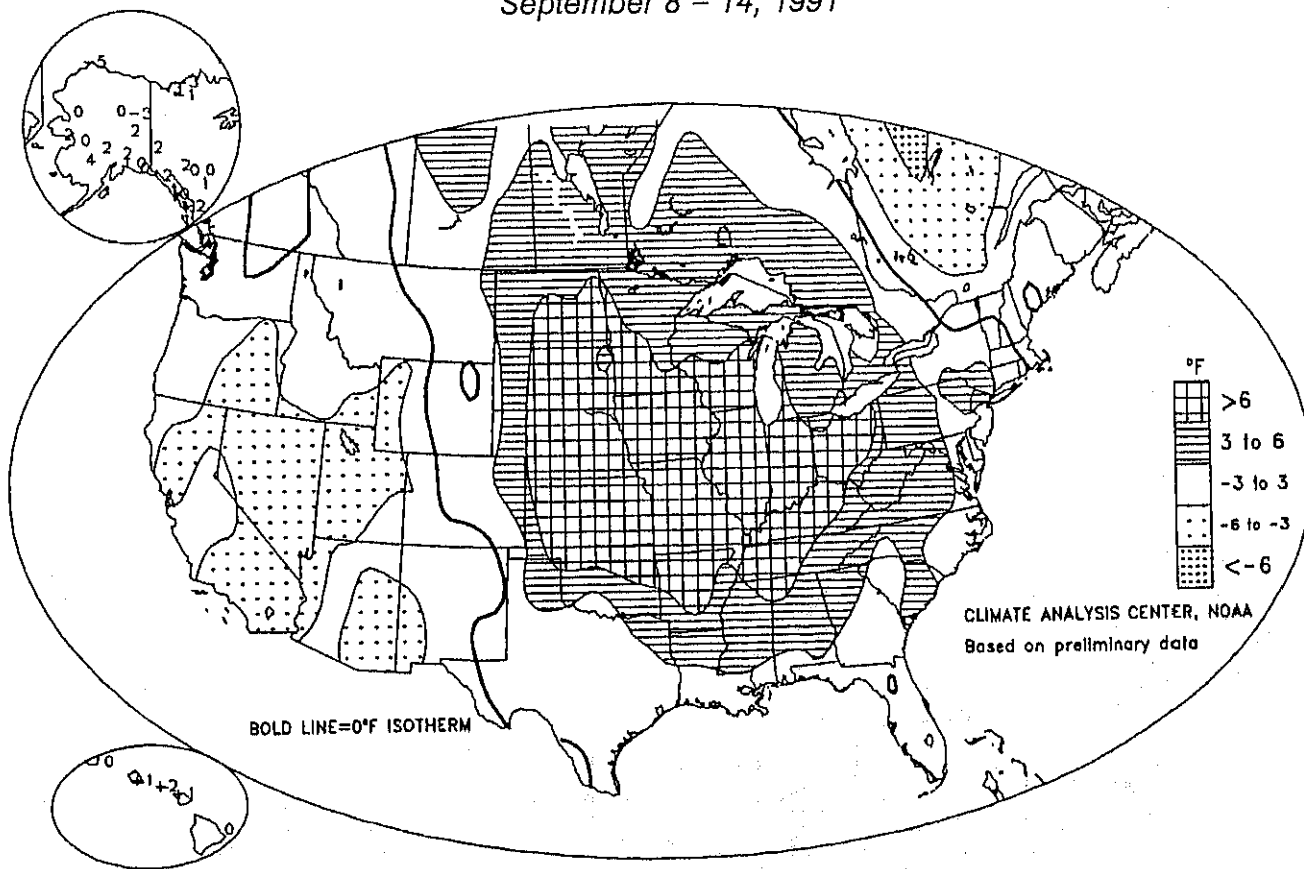


TABLE 2. SELECTED STATIONS WITH TEMPERATURES AVERAGING 10.0°F OR MORE ABOVE NORMAL FOR THE WEEK OF SEPTEMBER 8 - 14, 1991

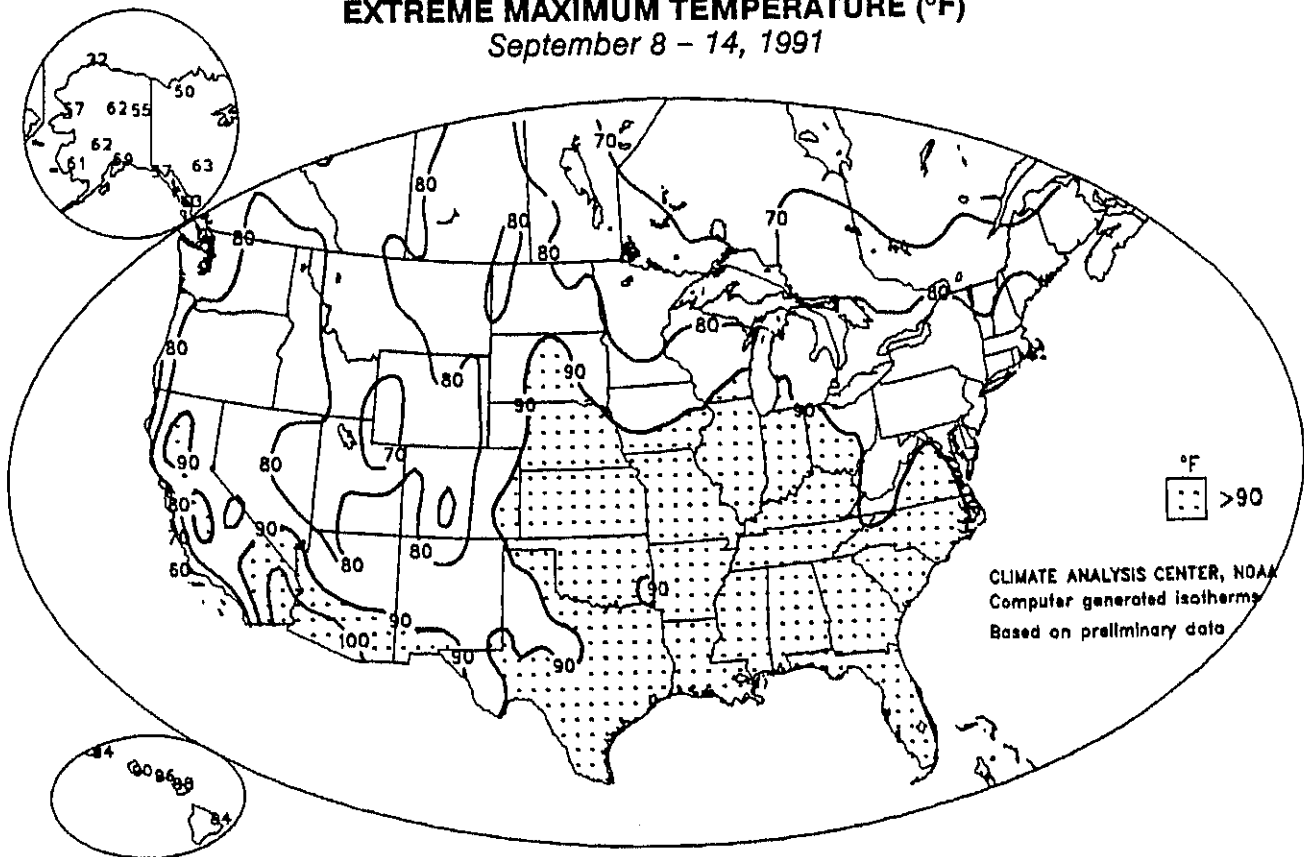
<u>STATION</u>	<u>DEPARTURE</u> (°F)	<u>AVERAGE</u> (°F)	<u>STATION</u>	<u>DEPARTURE</u> (°F)	<u>AVERAGE</u> (°F)
ST LOUIS, MO	+13.4	84.8	NORFOLK, NE	+10.7	75.6
LINCOLN, NE	+12.5	79.6	SALINA, KS	+10.6	81.7
TOPEKA, KS	+12.4	82.5	DECATUR, IL	+10.5	80.2
CHAMPAIGN, IL	+12.3	78.6	INDIANAPOLIS, IN	+10.4	78.6
CONCORDIA, KS	+12.2	81.7	OMAHA, NE	+10.3	77.8
BURLINGTON, IA	+11.5	78.6	OTTUMWA, IA	+10.3	77.3
RUSSELL, KS	+11.2	81.1	ROLLA, MO	+10.1	80.7
BELLEVILLE/SCOTT AFB, IL	+11.1	82.1	PEORIA, IL	+10.1	77.4
DES MOINES, IA	+11.1	77.4	KANSAS CITY/INTL, MO	+10.0	81.5
GRAND ISLAND, NE	+11.1	77.2	QUINCY, IL	+10.0	78.5
MOLINE, IL	+10.8	77.1	ROCKFORD, IL	+10.0	74.9

TABLE 3. SELECTED STATIONS WITH TEMPERATURES AVERAGING 3.5°F OR MORE BELOW NORMAL FOR THE WEEK OF SEPTEMBER 8 - 14, 1991

<u>STATION</u>	<u>DEPARTURE</u> (°F)	<u>AVERAGE</u> (°F)	<u>STATION</u>	<u>DEPARTURE</u> (°F)	<u>AVERAGE</u> (°F)
MEACHAM, OR	-9.0	48.4	BURNS, OR	-4.6	55.8
THERMAL, CA	-6.8	79.7	SALT LAKE CITY, UT	-4.6	62.1
BURBANK, CA	-6.1	66.8	SAN DIEGO/LINDBERGH, CA	-4.6	66.7
LONG BEACH, CA	-6.0	67.1	CALIENTE, NV	-4.5	62.7
ELY, NV	-5.4	52.8	WINSLOW, AZ	-4.2	66.5
PRICE, UT	-5.3	59.3	TONOPAH, NV	-4.0	61.2
DELTA, UT	-5.3	61.5	SAN BERNARDINO/NORTON, CA	-4.0	69.9
IMPERIAL, CA	-5.3	82.3	REDDING, CA	-3.9	73.6
OGDEN/HILL AFB, UT	-5.2	59.9	FT YUKON, AK	-3.8	39.9
OAKLAND, CA	-5.1	60.1	LOVELOCK, NV	-3.8	61.1
BARROW, AK	-5.0	27.9	CODY, WY	-3.7	55.5
LOS ANGELES, CA	-4.8	65.2	BAKERSFIELD, CA	-3.5	75.0
BLYTHE, CA	-4.7	84.1	LAS VEGAS, NV	-3.5	78.3

EXTREME MAXIMUM TEMPERATURE (°F)

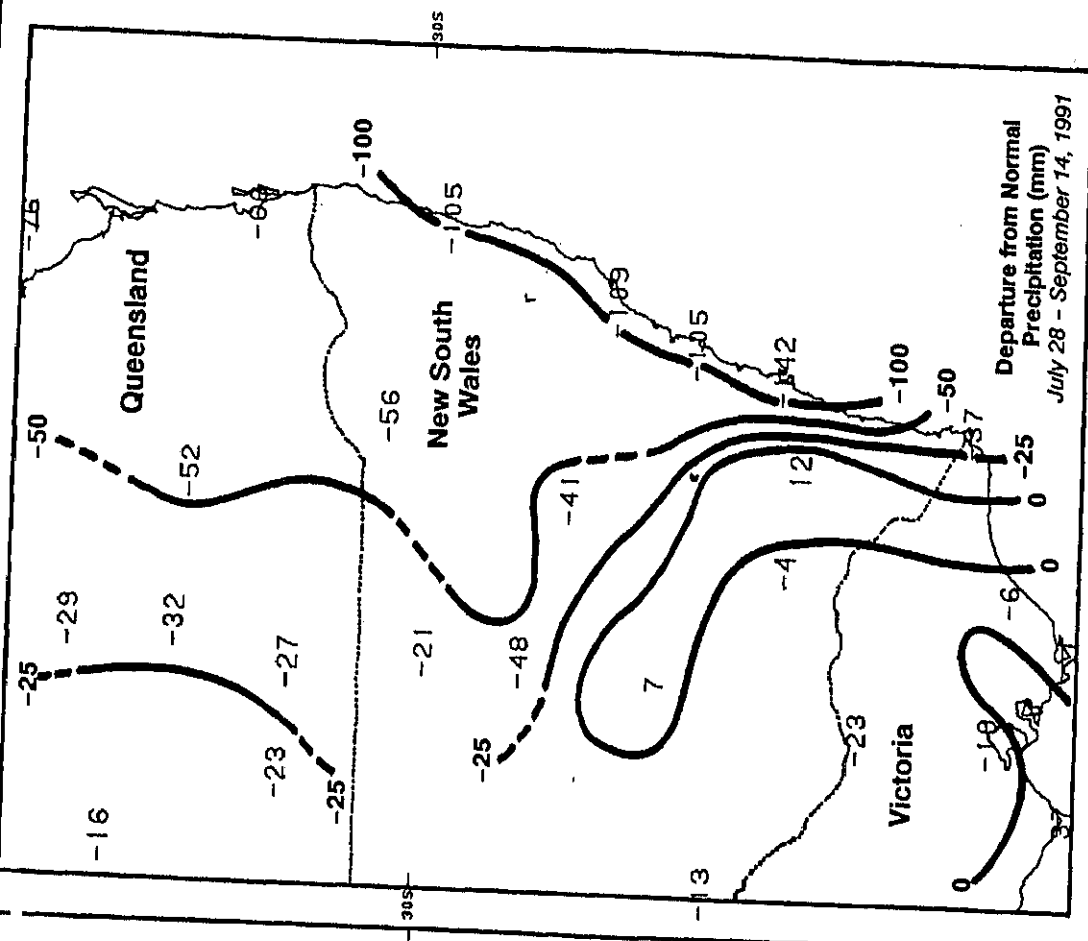
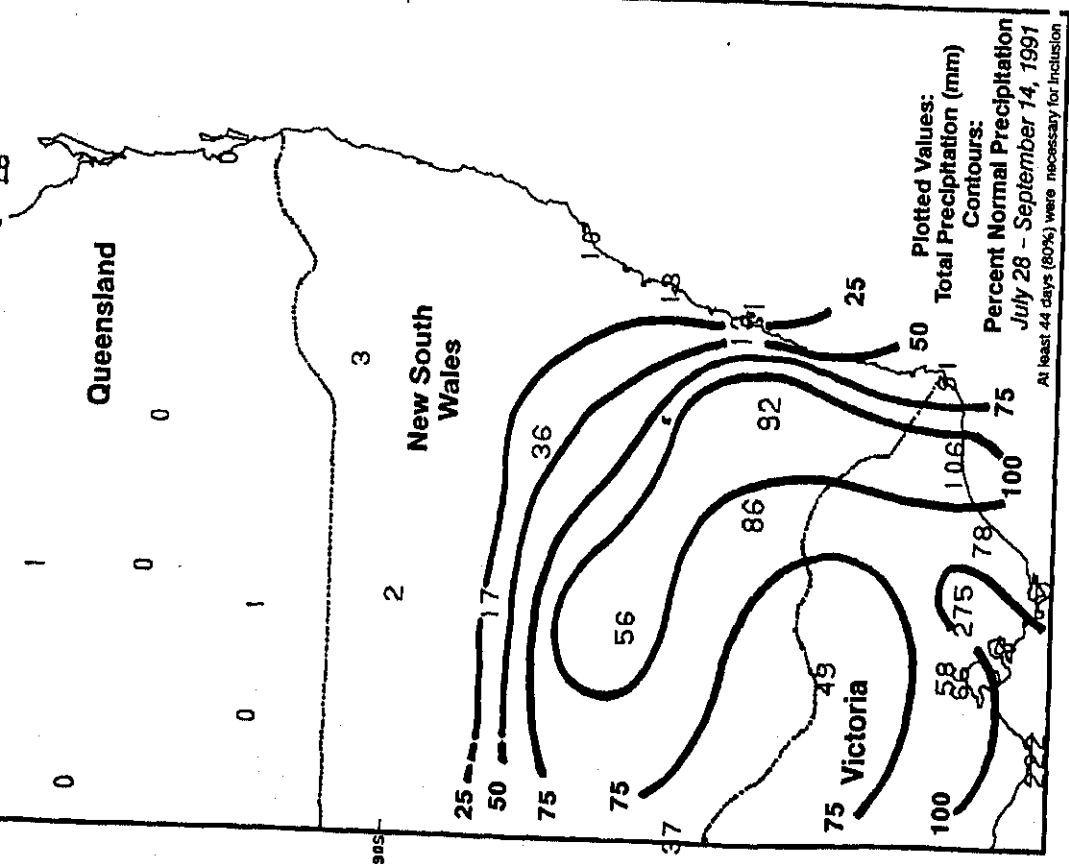
September 8 - 14, 1991



Unseasonable high temperatures above 90°F reached into the northern Plains, portions of the upper Great Lakes, and the southern mid-Atlantic (top). Uncomfortable apparent temperatures greater than 95°F covered much of the central and southern Plains, middle and lower Mississippi and Ohio Valleys, Southeast, southern mid-Atlantic, and desert Southwest (bottom).

EXTREME APPARENT TEMPERATURE (°F)

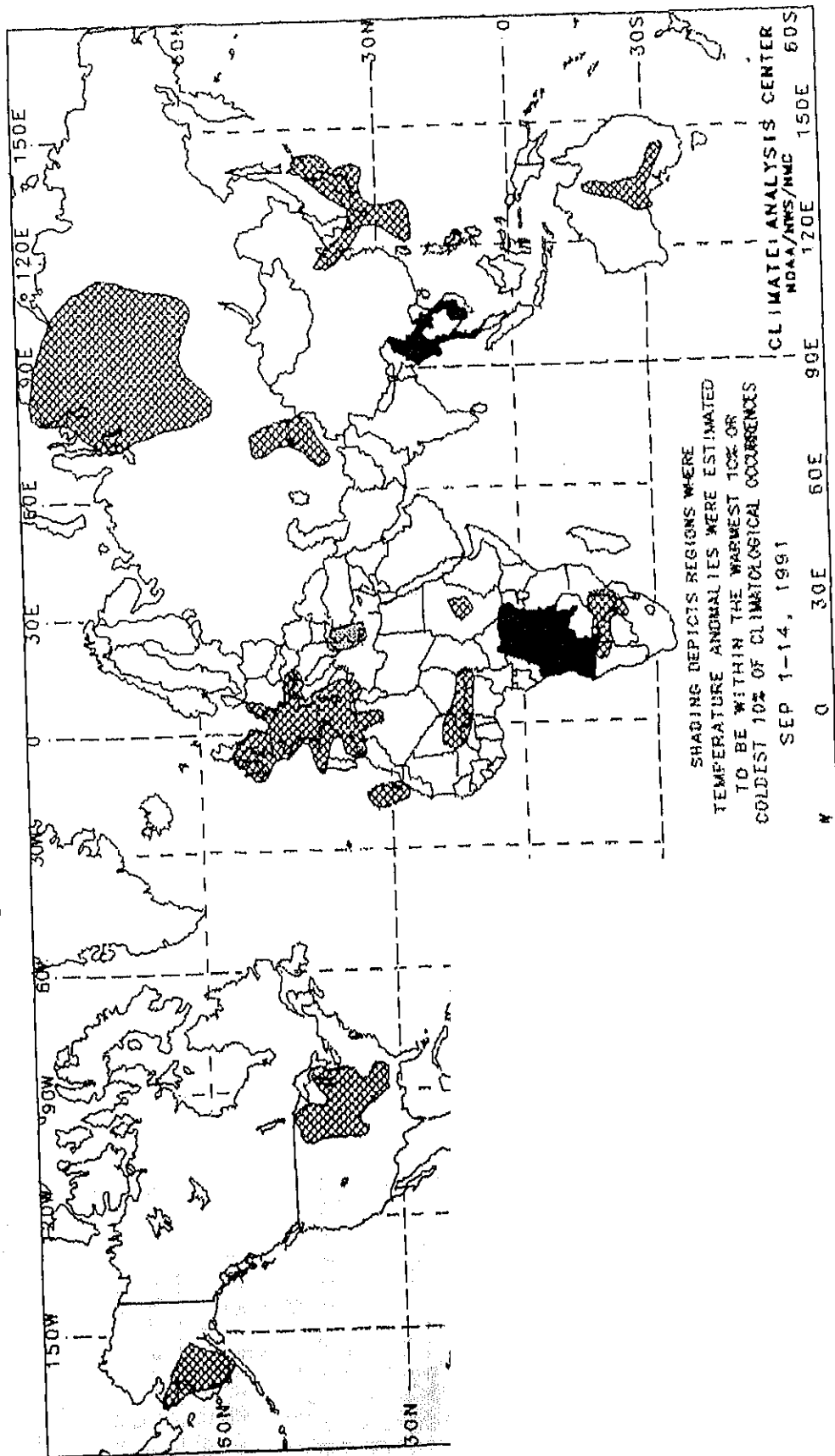
September 8 - 14, 1991



Little or no rain has fallen across the winter wheat area of southern Queensland and northern New South Wales since late July (left). Deficits exceeding 50 mm have accumulated since July 28 (right). In Queensland, where the harvest has begun, the crop yield is expected to be the lowest since 1971, according to press reports. In northern New South Wales, kangaroos from the Outback have been forced by the dryness to feed on the planted wheat, further reducing crop yields.

2-WEEK GLOBAL TEMPERATURE ANOMALIES

SEPTEMBER 1 - 14, 1991

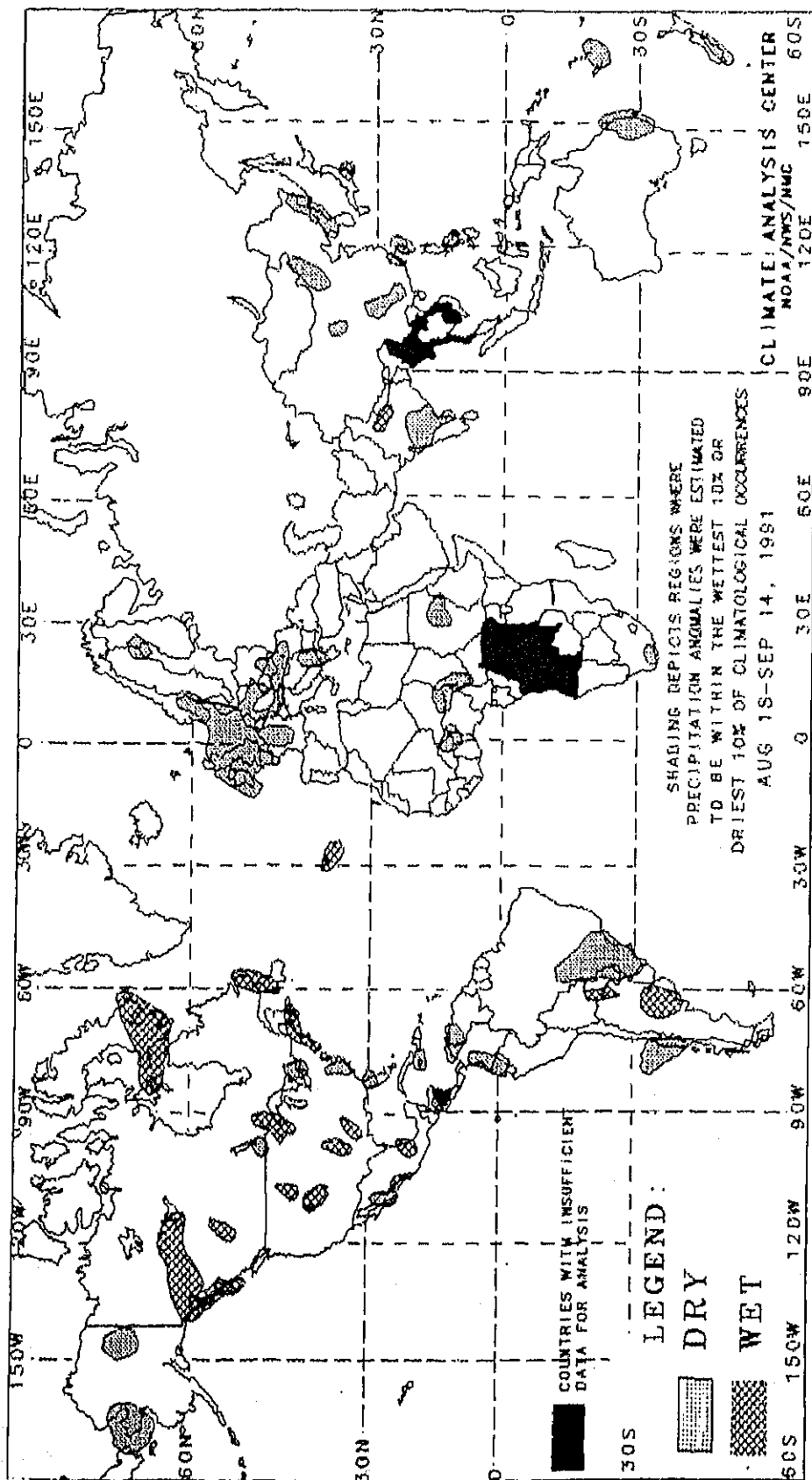


In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

This chart shows general areas of two week temperature anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

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The anomalies on this chart are based on approximately 2500 observing stations for which at least 27 days of precipitation observations (including zero amounts) were received or estimated from synoptic reports. As a result of both missing observations and the use of estimates from synoptic reports (which are conservative), a dry bias in the total precipitation amount may exist for some stations used in this analysis. This in turn may have resulted in an overestimation of the extent of some dry anomalies.

In climatologically arid regions where normal precipitation for the four week period is less than 20 mm, dry anomalies are not depicted. Additionally, wet anomalies for such arid regions are not depicted unless the total four week precipitation exceeds 50 mm.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

The chart shows general areas of four week precipitation anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

UNITED STATES SEASONAL CLIMATE SUMMARY

SUMMER (JUNE – AUGUST) 1991

During the summer season, the jet stream usually remains north of the continental U.S., only occasionally dipping southward to place the typically warm and moist air mass with cooler and drier air. During the summer of 1991, the jet stream made very few intrusions to the south as hot conditions dominated from the Plains eastward (page 12, Figure 4). In addition, the lack of southward jet stream penetration allowed abnormally dry weather to engulf the central Plains, middle Mississippi and Ohio Valleys, central Appalachians, and mid-Atlantic (page 13). The primary Corn and Soybean Belt, which encompasses a large portion of this area, had the ninth driest summer on record (back cover). In contrast, rainfall was quite heavy in the central and southern Rockies and southern High Plains (due to an early summer monsoon), in the southern Plains to the southern Atlantic coast (due to widespread tropical showers and thunderstorms) and in New England and along the mid-Atlantic coast (primarily due to Hurricane Bob). In addition, rare summer showers brought much above normal precipitation to parts of California (page 2), but since summer rainfall totals are typically very low in the West, the summer rains had little impact on the five year drought hat state.

June was highlighted by warm and occasionally violent weather in the Great Plains, lower Mississippi Valley, and the Southeast while abnormally dry conditions were the norm in the Great Lakes region, middle Mississippi and Ohio Valleys, Northeast, and parts of the mid-Atlantic, where a couple of dry months had already been recorded. The month commenced with severe weather and sweltering heat plaguing the nation's midsection. Torrential rains inundated portions of the western Corn Belt, central and southern Plains, central Atlantic coast, Tennessee Valley, and Southeast. Dozens of tornadoes headed down from the Plains to the Atlantic coast. Hot air spread across much of the country by mid-month with Philadelphia, PA hitting 100°F on the 15th, setting a June record. During the latter half of the month, widespread thunderstorms again triggered tornadoes, flash flooding, large hail and strong winds across the central, lower Mississippi Valley, and Southeast. Scattered heavy rains provided some relief from dryness in the mid-Atlantic but little or no relief across the Corn Belt, upper Ohio Valley and Northeast. Temperatures in Alaska soared into the nineties throughout the month as most of the state experienced its hottest summer solstice on record. In sharp contrast, unusually chilly conditions prevailed in the Pacific Northwest and northern California.

Hot, muggy, and wet weather prevailed during July from the central and eastern Gulf coast to the southern mid-Atlantic. Severe thunderstorms caused localized flooding, with over 12 inches of rain in parts of the region. Columbia, SC was deluged with 17.46 inches, making July 1991 its wettest month on record. Mid-summer monsoon rains also brought localized flooding to the central and southern Rockies and southern High Plains where some locations received 2 to 5 times their normal July rainfall. Frequent thunderstorms erupted across the southern Plains, upper Mississippi Valley, and Great Lakes while isolated but intense thunderstorms drenched parts of the middle Mississippi Valley during the first half of the month. Predominantly dry and hot weather intensified drought conditions from the central Plains eastward across the Corn Belt and the Northeast and mid-Atlantic. Unusual summer rains also drenched parts of the Far West, where a few tenths of an inch broke the record in typically dry Los Angeles and San Diego. Farther north,

cool air settled across Alaska, replacing the abnormally warm weather that enveloped the state during June.

The first hurricane of the season, Bob, slammed into eastern New England on August 19th, causing considerable damage with winds gusting to 125 mph and torrential rains of three to seven inches. Total damage estimates ranked Bob as the second most destructive hurricane in the United States (behind Hurricane Hugo) in terms of insurable losses with total damage estimated at \$1.5 billion. Bob combined with occasional heavy thunderstorms to dump up to five times the normal rainfall on parts of New England. Elsewhere, thunderstorms drenched the South from eastern Texas to the southern Atlantic coast. In contrast, abnormally dry weather again prevailed over much of the Corn Belt and mid-Atlantic as thundershowers were widely scattered. Farther west, the remnants of Tropical Storm Hilda spread light rains into northern and central California, producing rare summer showers while torrential rain, associated with the remnants of Hurricane Fefa, inundated parts of eastern Hawaii with nearly 20 inches.

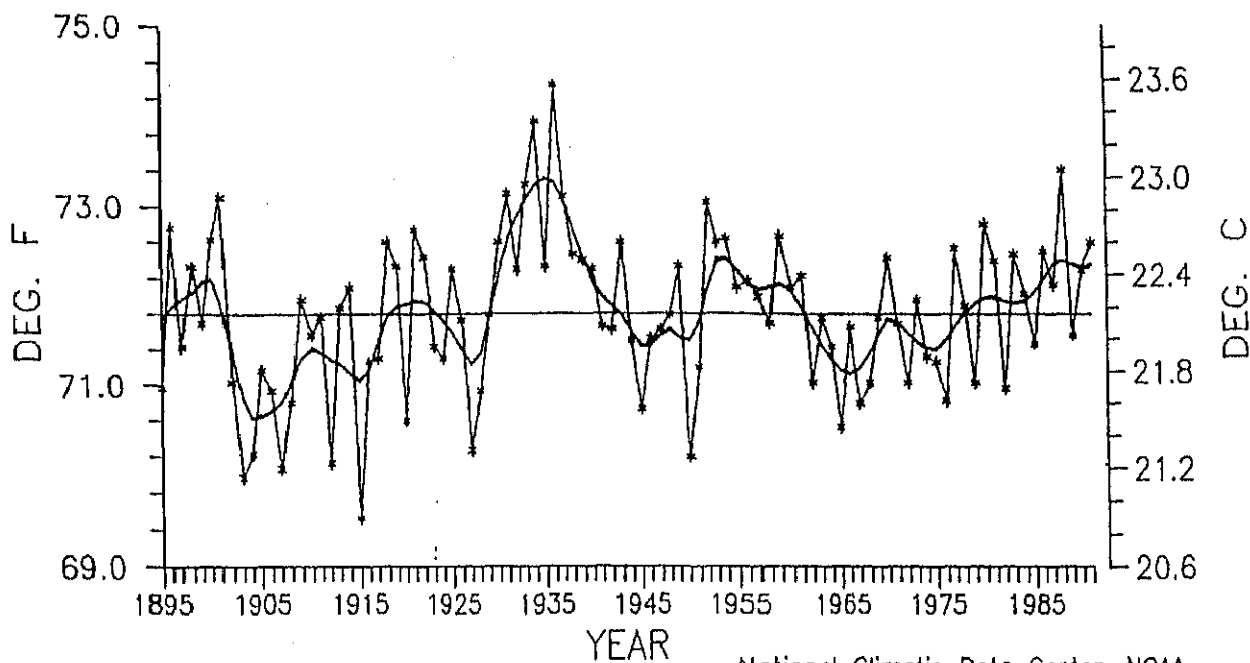
According to the River Forecast Centers, the greatest summer rainfall (more than 15 inches) fell from northern Texas and southern Oklahoma into northern Arkansas, across southeastern Texas and the lower Mississippi Delta, in much of the Southeast, in portions of the mid-Atlantic, the Alaskan panhandle, eastern Hawaii, and most of New England. Surplus summer rains also moistened portions of the Far West, Rockies, Great Plains, upper and lower Mississippi Valley, Great Lakes, and much of the Southeast, the Atlantic coast, Hawaii and southern Alaska (page 12, Figure 2). Regionally, the Southeast, West, and Northwest ranked in the wetter third of the historical distribution (page 11), while only two states (CA and NH) had one of the ten wettest summers on record (page 16).

In contrast, subnormal seasonal rainfall afflicted much of the northeast quarter of the U.S. from the central Plains to the Northeast and mid-Atlantic, portions of the northern Plains, northern Rockies, lower Rio Grande Valley, northern and central Alaska, and the island of Oahu (Figure 1, page 13). Seasonably dry weather prevailed in most of the Far West. Eight states (OH, AZ, IN, WV, IL, NY, MD, and PA) observed one of the nine driest summers since 1985 (page 16), and the Central region experienced the fifth driest (page 11). Nationally, 1991 ranked as the 42nd driest summer, based on the National Precipitation Index (page 10).

Temperatures averaged above normal across much of the nation, particularly from the northern Rockies to the northern and mid-Atlantic coast where departures exceeded +2°F. Temperatures also averaged more than 2°F above normal in parts of the central Plains, middle Mississippi Valley, Intermountain West, and western Alaska (Table 3, Figure 4). Ten states (PA, ND, OH, VA, NJ, RI, MD, WV, and WY) experienced one of the ten warmest summers on record (page 16), and all regions except the Northwest recorded temperatures at or above the long-term mean. Nationally, this was the 19th warmest summer since 1895 (page 10).

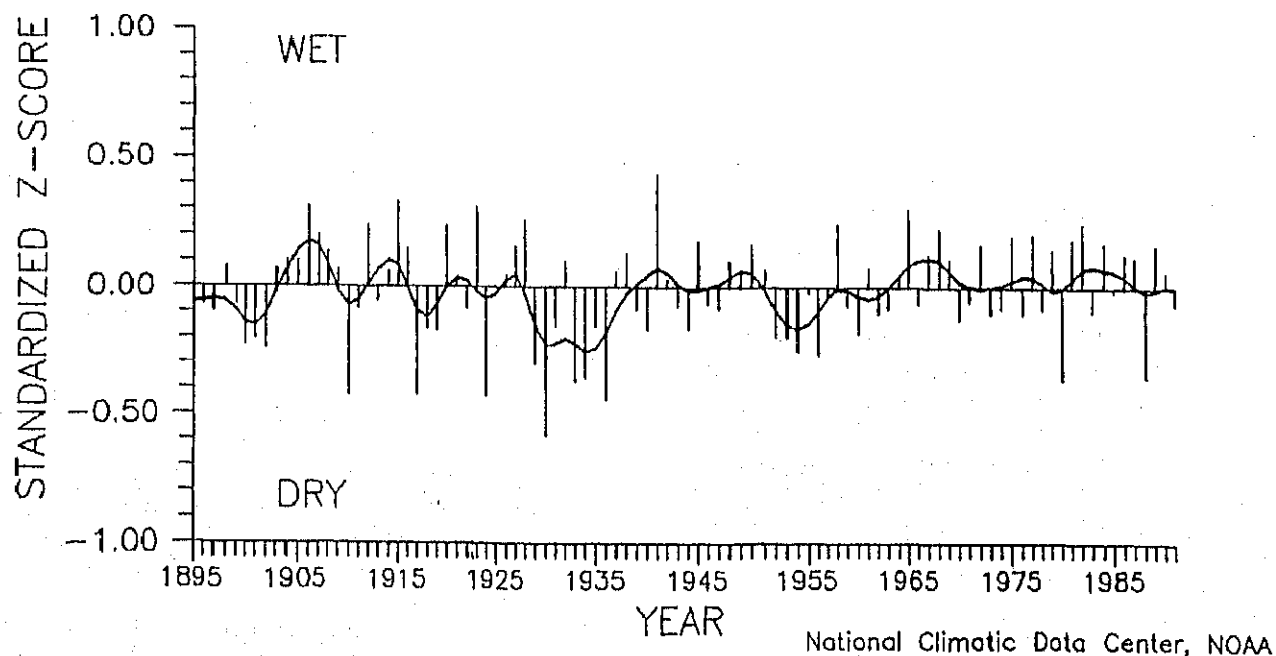
Subnormal summer temperatures prevailed only in parts of the Far West, central and southern Rockies, southern Plains, lower Mississippi Valley, and Southeast (page 15). Departures lower than -2°F were limited to western Oregon, southern California, the upper Rio Grande Valley, and central Texas. Three states (NM, CA, and OR) ranked among the cooler third of the historical distribution, with New Mexico having its 8th coolest summer on record (page 16).

U.S. NATIONAL TEMPERATURE JUN-AUG, 1895-1991



Nationally Averaged Summer (June-August) Temperatures, 1895-1991, As Computed by the National Climatic Data Center. Summer 1991 ranked as the 19th warmest on record. The smooth curve, showing the long-term trend, suggests that the summers of the last nine years have been comparable to those of the 1950's but considerably cooler than during the 1930's.

U.S. NATIONAL WEIGHTED MEAN PRECIPITATION INDEX JUN-AUG, 1895-1991

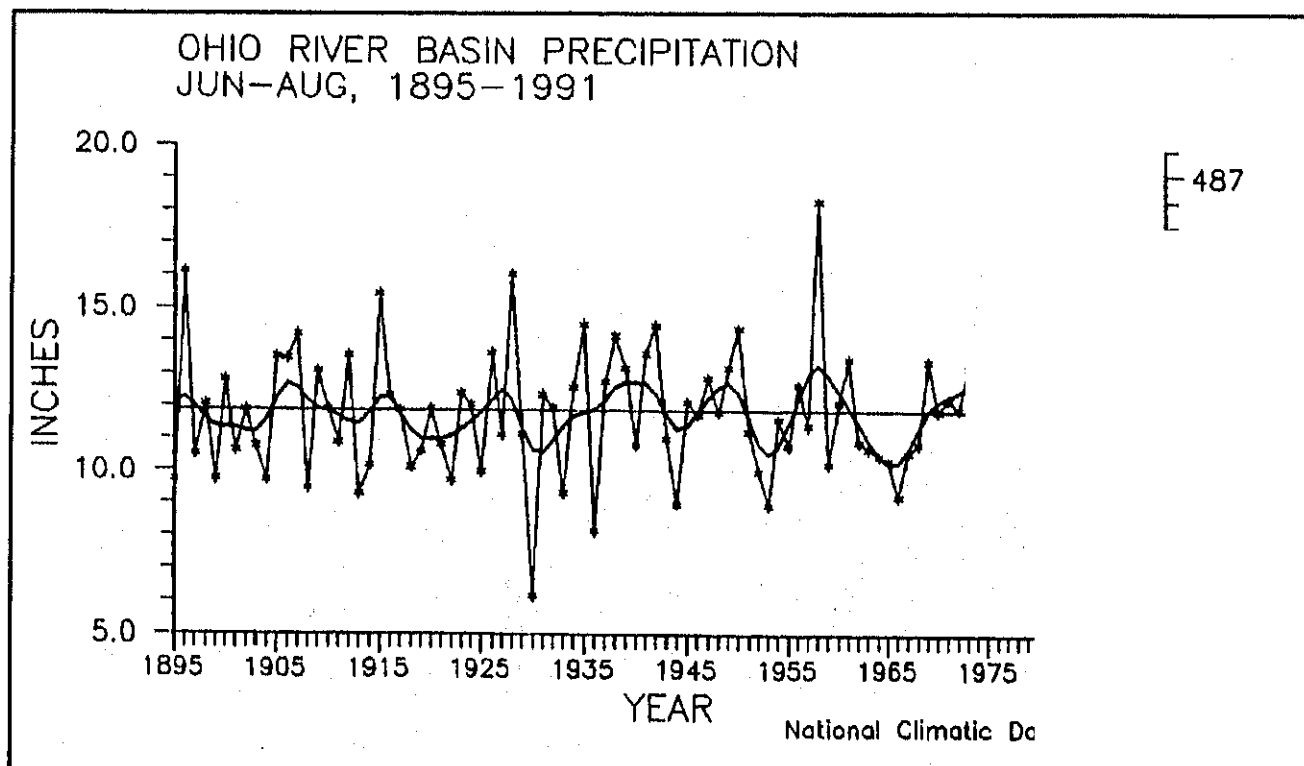


National Mean August Precipitation Index, 1895-1991, As computed by the National Climatic Data Center. Summer 1991 ranked slightly below the median as the 42nd driest summer on record. This index takes local normals into account so that typically wet regions do not dominate the index value. The long-term trend, represented by the smoothed line, has been near or slightly above the median for nearly 30 years.

**TEMPERATURE AND PRECIPITATION RANKINGS FOR
JUN-AUG 1991, BASED ON THE PERIOD 1895 TO 1991. 1 =
DRIEST/COLDEST AND 97 = WETTEST/HOTTEST.**

REGION	PRECIPITATION	TEMPERATURE
NORTHEAST	27	90
EAST NORTH CENTRAL	29	86
CENTRAL	5	82
SOUTHEAST	77	67
WEST NORTH CENTRAL	34	86
SOUTH	63	54
SOUTHWEST	45	48
NORTHWEST	66	43
WEST	75	48
NATIONAL	42	79

National Climatic Data Center



Summer (June-August) Averaged Precipitation over the Ohio River Basin, 1895 - 1991. The Ohio River Basin, which drains a large part of the Central United States, recorded exceptionally low rainfall totals during Summer 1991, recording the third driest summer in the last nine summers (1983, 1984, 1988, 1991) have brought significantly below normal precipitation totals.

TABLE 1. SELECTED STATIONS WITH 150% OR MORE OF THE NORMAL PRECIPITATION AND 16.00 INCHES OR MORE PRECIPITATION; OR, STATIONS WITH 20.00 INCHES OR MORE PRECIPITATION AND NO NORMALS DURING SUMMER 1991.

<u>STATION</u>	<u>TOTAL (INCHES)</u>	<u>PCT. OF NORMAL</u>	<u>STATION</u>	<u>TOTAL (INCHES)</u>	<u>PCT. OF NORMAL</u>
YAKUTAT, AK	48.52	203.1	AUGUSTA, GA	23.67	194.0
HILO/LYMAN, HAWAII, HI	46.29	186.9	ATHENS, GA	22.30	174.8
DAYTONA BEACH, FL	32.23	176.4	BEAUFORT MCAS, SC	22.03	***
NEW ORLEANS/MOISANT, LA	31.72	183.1	MILTON/WHITING NAS, FL	21.81	***
JACKSONVILLE, FL	31.08	155.7	CRESTVIEW, FL	21.19	***
SAVANNAH, GA	31.03	157.4	JACKSONVILLE/CECIL, FL	20.91	***
APALACHICOLA, FL	29.81	153.4	VALDOSTA/MOODY AFB, GA	20.87	***
COLUMBIA, SC	28.78	187.4	VALDOSTA, GA	20.62	***
JACKSONVILLE NAS, FL	27.52	***	HOMESTEAD AFB, FL	20.24	***
NEW ORLEANS NAS, LA	27.42	***	ATLANTA, GA	20.19	175.7
CAPE HATTERAS, NC	27.09	171.8	PORTLAND, ME	19.03	220.0
NEW ORLEANS/LAKE FRONT, LA	27.05	***	QUILLAYUTE, WA	18.64	223.2
CHERRY POINT MCAS, NC	25.32	***	LUFKIN, TX	17.87	206.4
JACKSONVILLE/NEW RIVER MCAS, NC	23.81	***	VICTORIA, TX	16.10	154.2

NOTE: Stations without precipitation normals are indicated by asterisks.

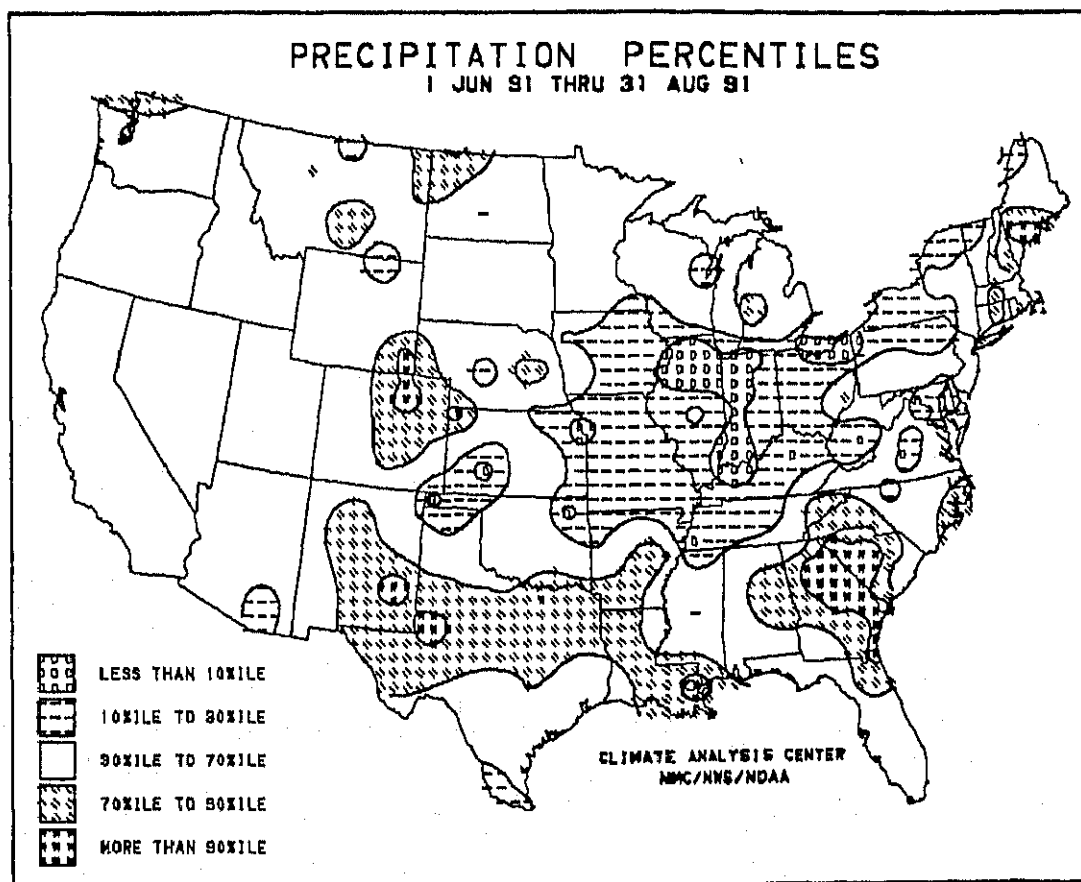


Figure 1. Summer (June – August) 1991 Precipitation Percentiles. *Significantly above normal rainfall [>70 thile] was observed from the southern Rockies to the lower Mississippi Valley, and in the central and northern Rockies, the Southeast, New England, and the northern Plains. Summer rainfall among the driest third of climatological occurrences [30thile] covered areas from the central Plains to the Northeast and mid-Atlantic.*

TABLE 2. SELECTED STATIONS WITH 50% OR LESS OF THE NORMAL PRECIPITATION AND NORMAL PRECIPITATION OF 6.00 INCHES OR MORE DURING SUMMER 1991.

STATION	TOTAL (INCHES)	PCT. OF NORMAL	NORMAL (INCHES)	STATION	TOTAL (INCHES)	PCT. OF NORMAL	NORMAL (INCHES)
SIDNEY, NE	2.48	30.8	8.04	MORGANTOWN, WV	5.14	41.2	12.47
DODGE CITY, KS	2.57	30.0	8.57	FT DODGE, IA	5.15	37.7	13.67
ILIAMNA, AK	2.60	31.4	9.24	TULSA, OK	5.17	48.9	11.03
AKRON, OH	3.18	30.2	10.53	ZANESVILLE, OH	5.23	42.4	12.34
LEWISTOWN, MT	3.29	47.9	6.87	PEORIA, IL	5.26	48.7	11.28
PRESCOTT, AZ	3.53	49.5	7.13	JOPLIN, MO	5.38	45.7	11.74
EVANSVILLE, IN	3.69	34.9	10.58	BALTIMORE-WASHINGTON INTL, MD	5.38	44.1	12.21
MOULNE, IL	3.79	29.4	12.90	MEMPHIS, TN	5.40	47.8	11.30
TOLEDO, OH	3.98	40.6	9.80	LAFAYETTE, IN	5.43	48.3	11.74
EL DORADO, AR	4.15	39.3	10.57	SOUTH BEND, IN	5.64	49.1	11.48
MARTINSBURG, WV	4.29	41.4	10.38	ROCKFORD, IL	5.77	45.3	12.74
TOPEKA, KS	4.72	38.6	12.88	KANSAS CITY/INTL, MO	6.15	49.0	12.58
BURLINGTON, IA	4.73	38.7	12.22	CHANUTE, KS	6.34	47.2	13.42
CEDAR RAPIDS, IA	5.11	39.9	12.80				

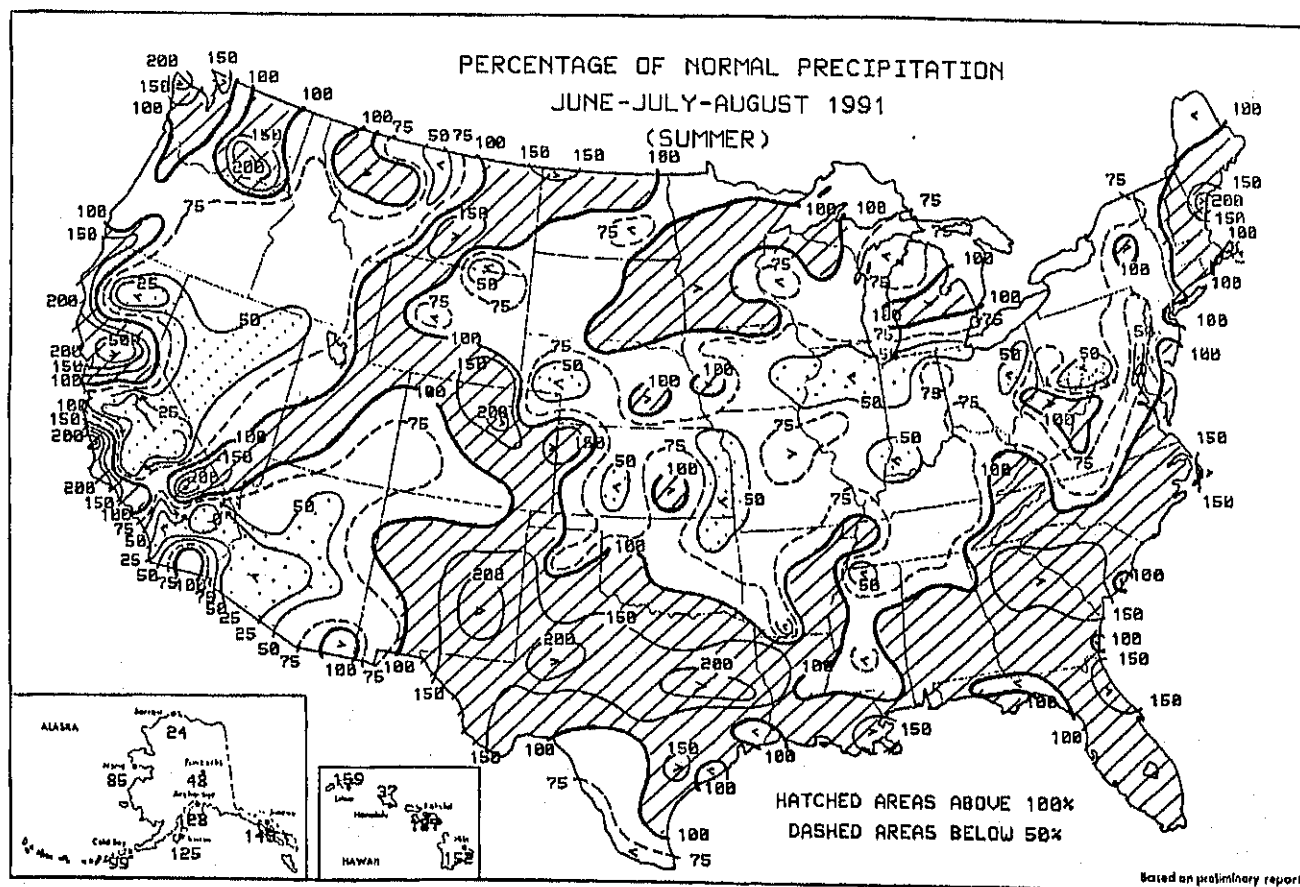


Figure 2. Summer (June - August) 1991 Percent of Normal Precipitation. *Isopleths drawn for 0, 25, 50, 75, 100, 150, 200, and 500 percent. Surplus summer rains fell across much of the southern tier of states from the southern Rockies to the southern Atlantic coast, the Atlantic seaboard, southern Alaska, Hawaii, and portions of the central and northern Rockies, central and northern Plains, upper Mississippi Valley, Great Lakes, and Far West. In contrast, subnormal seasonal totals were measured from the central Plains to the Northeast and mid-Atlantic, and across portions of the northern Plains, the northern Rockies, the lower Rio Grande Valley, and northern and central Alaska. Seasonably dry conditions prevailed in much of the Far West.*

TABLE 3. SUMMER 1991 AVERAGE TEMPERATURE 3.0°F OR MORE ABOVE NORMAL.

<u>STATION</u>	<u>DEPARTURE</u> (°F)	<u>AVERAGE</u> (°F)	<u>STATION</u>	<u>DEPARTURE</u> (°F)	<u>AVERAGE</u> (°F)
MILWAUKEE, WI	+4.4	72.9	BOZEMAN, MT	+3.4	66.0
ERIE, PA	+4.2	72.1	HANCOCK/HOUGHTON CO, MI	+3.4	65.6
NOME, AK	+4.0	52.6	VICTORVILLE/GEORGE AFB, CA	+3.3	79.1
AKRON, OH	+3.9	73.8	ST LOUIS, MO	+3.2	80.2
TRAVERSE CITY, MI	+3.9	70.5	WILLIAMSPORT/LYCOMI, PA	+3.2	73.8
FT LAUDERDALE, FL	+3.8	85.7	TOLEDO, OH	+3.2	73.5
PITTSBURGH, PA	+3.8	74.2	DETROIT, MI	+3.2	73.5
PELLSTON, MI	+3.6	67.0	RENO, NV	+3.2	69.5
LOUISVILLE/STANDIFORD, KY	+3.5	79.6	HELENA, MT	+3.2	67.8
COLUMBUS, OH	+3.5	75.9	INTERNATIONAL FALLS, MN	+3.2	66.7
SOUTH BEND, IN	+3.5	74.3	BECKLEY, WV	+3.1	71.0
PHILADELPHIA, PA	+3.4	77.9	DEVIL'S LAKE, ND	+3.1	68.9
BISMARCK, ND	+3.4	71.3	HOUGHTON LAKE, MI	+3.1	68.1
GRAND FORKS, ND	+3.4	70.0	ZANESVILLE, OH	+3.0	73.9

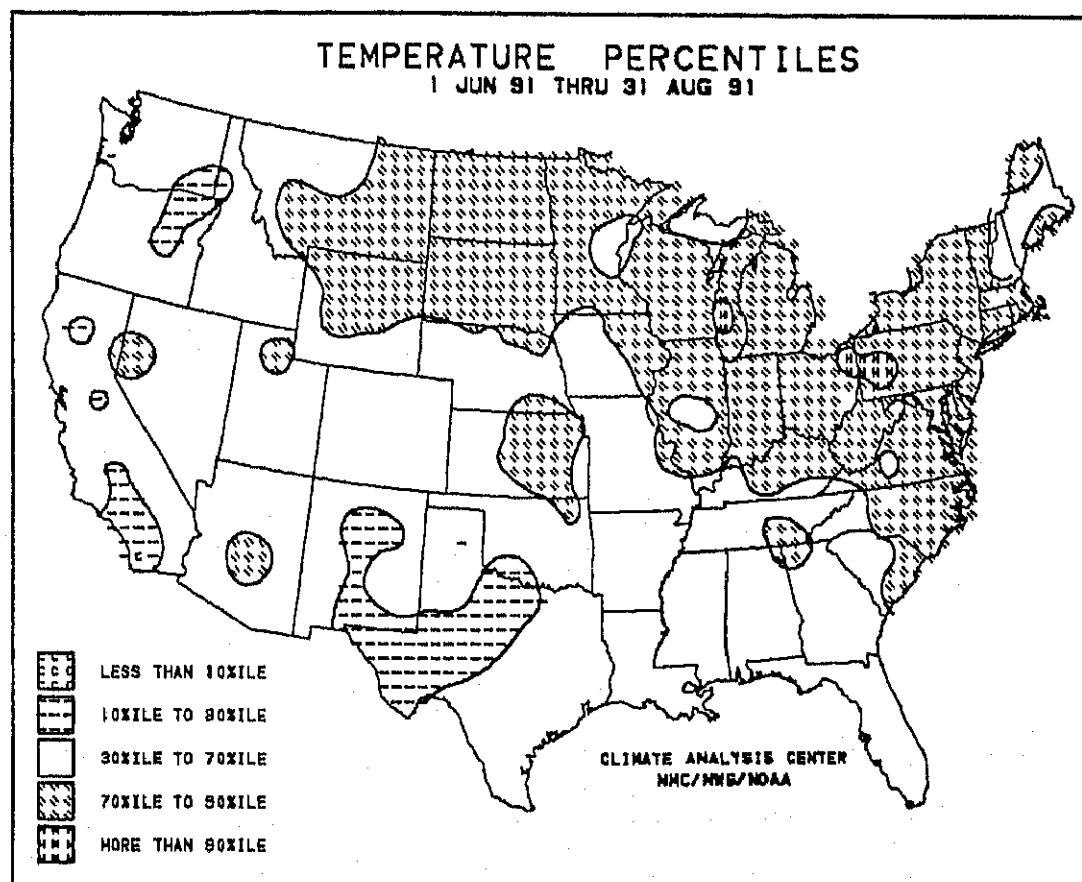


Figure 3. Summer (June – August) 1991 Temperature Percentiles. Summer temperatures among the warmest third of the historical distribution [$>70\%$ ile] were found in a broad area from the northern Rockies to the northern and mid-Atlantic coast, and across portions of the central Plains, Southeast, and Intermountain West. Unusually cool conditions [$<30\%$ ile] were limited to portions of the southern Rockies, southern Plains, and Pacific Coast states.

TABLE 4. SUMMER 1991 AVERAGE TEMPERATURE 2.0°F OR MORE BELOW NORMAL.

<u>STATION</u>	<u>DEPARTURE</u> (°F)	<u>AVERAGE</u> (°F)	<u>STATION</u>	<u>DEPARTURE</u> (°F)	<u>AVERAGE</u> (°F)
MEACHAM, OR	-4.4	55.5	PENDLETON, OR	-2.5	68.2
WINSLOW, AZ	-4.0	71.8	EL PASO, TX	-2.5	79.0
TUCUMCARI, NM	-3.4	74.3	THERMAL, CA	-2.5	86.9
DEMING, NM	-2.9	75.4	LONG BEACH, CA	-2.3	69.6
BLYTHE, CA	-2.8	89.5	IMPERIAL, CA	-2.3	87.4
ABILENE, TX	-2.6	79.9	BURNS, OR	-2.2	63.6
SAN ANGELO, TX	-2.6	80.1	MIDLAND, TX	-2.1	78.7

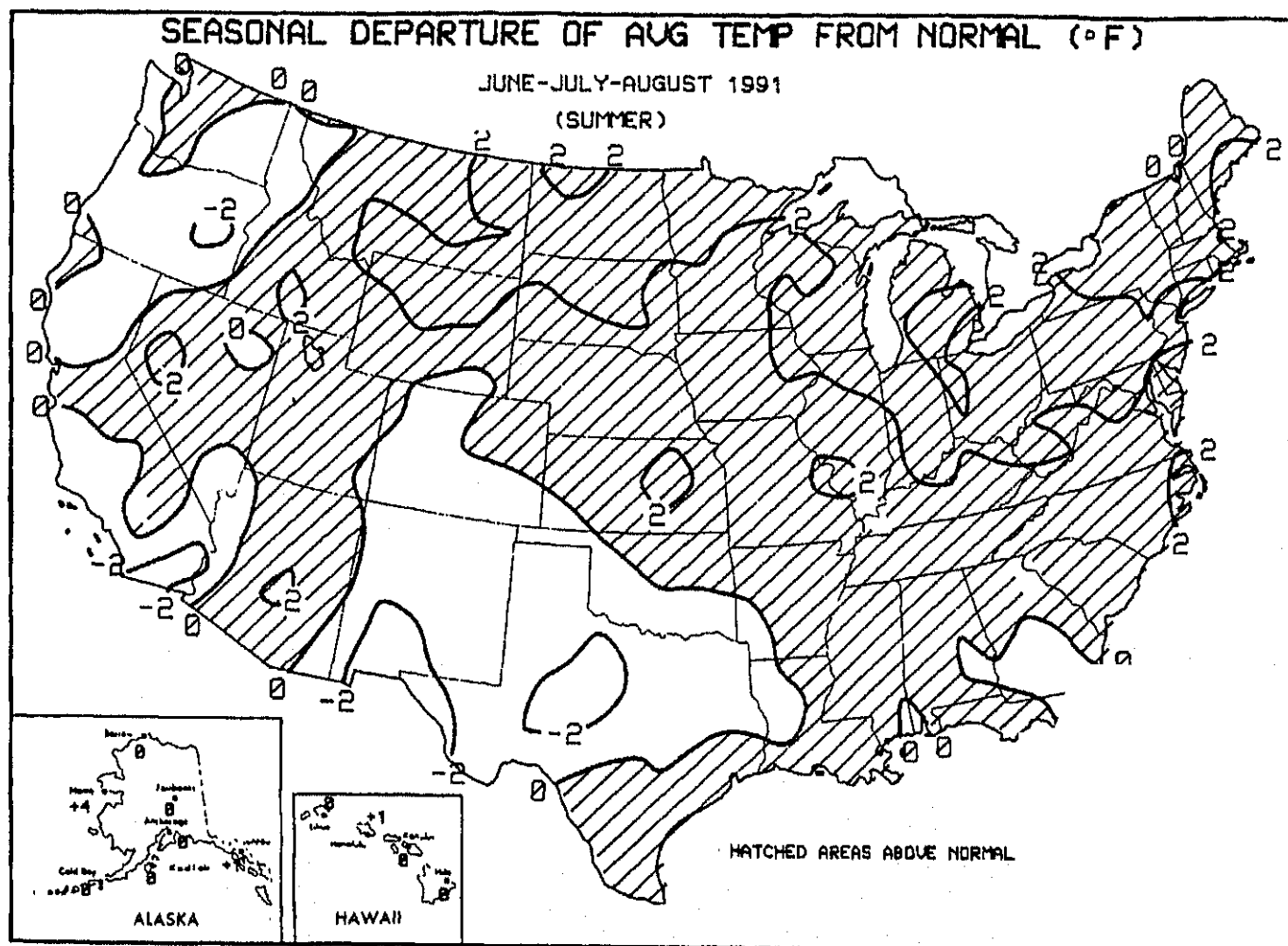


Figure 4. Summer (June - August) 1991 Departure of Average Temperature from Normal only for -2°F, 0°F, and 2°F. Much of the nation again experienced warmer than normal conditions as +2°F from the northern Rockies to the northern and mid-Atlantic coast, and in portions of the mid-Plains, and Intermountain West. Temperatures more than 2°F below normal were confined to pockets Grande Valley, and southern Plains.

**PRECIPITATION RANKINGS FOR JUN-AUG 1991, BASED ON
THE PERIOD 1895 TO 1990. 1 = DRIEST, 97 = WETTEST.**

<u>STATE</u>	<u>RANK</u>	<u>STATE</u>	<u>RANK</u>	<u>STATE</u>	<u>RANK</u>	<u>STATE</u>	<u>RANK</u>
AL	53	IA	14	NE	24	RI	55
AZ	3	KS	16	NV	48	SC	85
AR	32	KY	16	NH	92	SD	36
CA	94	LA	74	NJ	65	TN	25
CO	73	ME	62	NM	80	TX	87
CT	81	<i>MD</i>	9	<i>NY</i>	7	UT	52
DE	49	MA	69	NC	73	VT	70
FL	83	MI	46	ND	30	VA	20
GA	84	MN	44	<i>OH</i>	2	WA	87
ID	36	MS	43	OK	38	WV	6
<i>IL</i>	7	MO	13	OR	57	WI	30
<i>IN</i>	4	MT	52	<i>PA</i>	9	WY	61

National Climatic Data Center

Top 10 rankings : **BOLD**

Bottom 10 rankings : *Italics*

**TEMPERATURE RANKINGS FOR JUN-AUG 1991, BASED ON
THE PERIOD 1895 TO 1991. 1 = COLDEST AND 97 = WARMEST.**

<u>STATE</u>	<u>RANK</u>	<u>STATE</u>	<u>RANK</u>	<u>STATE</u>	<u>RANK</u>	<u>STATE</u>	<u>RANK</u>
AL	35	IA	80	NE	70	RI	91
AZ	64	KS	82	NV	67	SC	64
AR	52	KY	85	NH	79	SD	84
CA	27	LA	47	NJ	91	TN	69
CO	60	ME	86	<i>NM</i>	8	TX	37
CT	86	MD	90	NY	83	UT	67
DE	70	MA	77	NC	88	VT	87
FL	78	MI	87	ND	92	VA	92
GA	33	MN	84	OH	93	WA	35
ID	70	MS	68	OK	71	WV	90
IL	73	MO	74	OR	27	WI	84
IN	81	MT	81	PA	94	WY	89

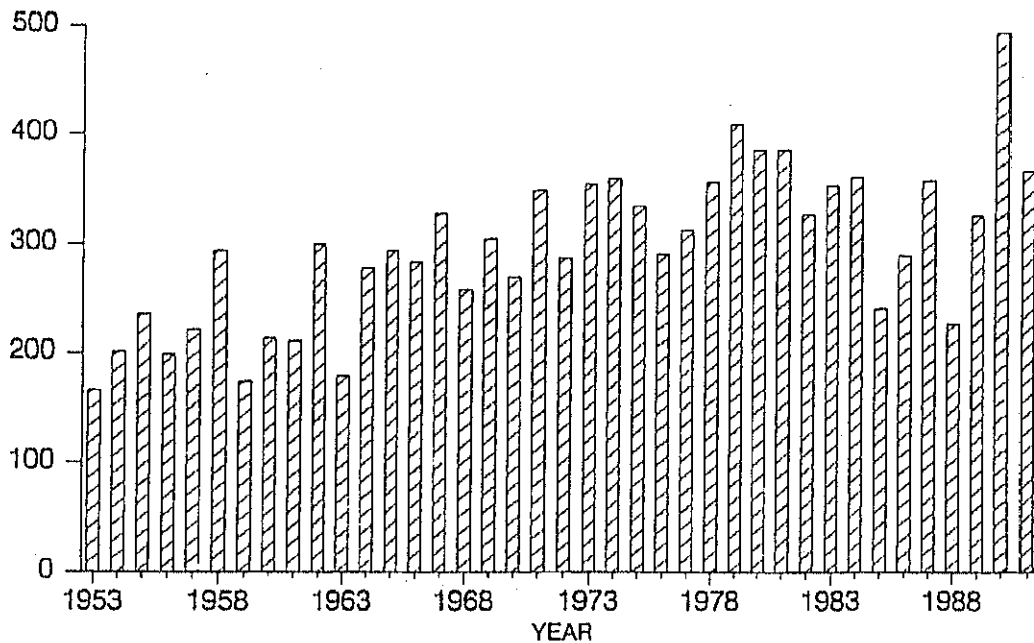
National Climatic Data Center

Top 10 rankings : **BOLD**

Bottom 10 rankings : *Italics*

TOTAL NUMBER OF TORNADES, U.S.

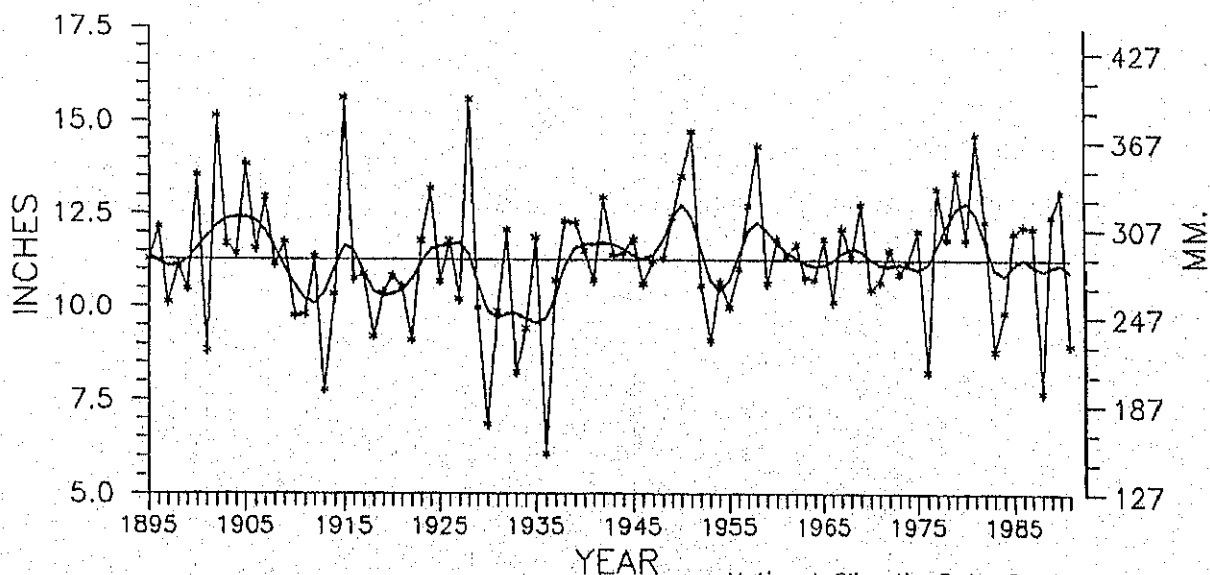
SUMMER (JJA) TOTAL, 1953-1991



National Climatic Data Center, NOAA

Total Number of Tornadoes in the Contiguous U.S., Summer (June - August), 1953 - 1991. According to preliminary NWS data, there were 366 tornadoes across the nation during the summer of 1991. This is above the long-term mean of 290, but below the record of 499 set last year. The elevated summer total is largely due to the high number of tornadoes in June (231). In addition, the 1991 total is preliminary, and may be overestimated by 10% - 20%, as was the case with 1990 preliminary data.

PRIMARY CORN AND SOYBEAN BELT PRECIPITATION JUN-AUG, 1895-1991



National Climatic Data Center, NOAA

Summer (June - August) Precipitation, 1895 - 1991, for the Primary Corn and Soybean Belt. Summer 1991 was the ninth driest such period on record for the primary Corn and Soybean Belt (see Weekly Climate Bulletin, 91/36, inside back cover, dated September 7, 1991, for a definition of the region). Four of the last nine summers have brought abnormally dry weather to the region.